# RECENT ERUPTION OF DEEP GROUNDWATER INTO ATHABASCA VALLIS

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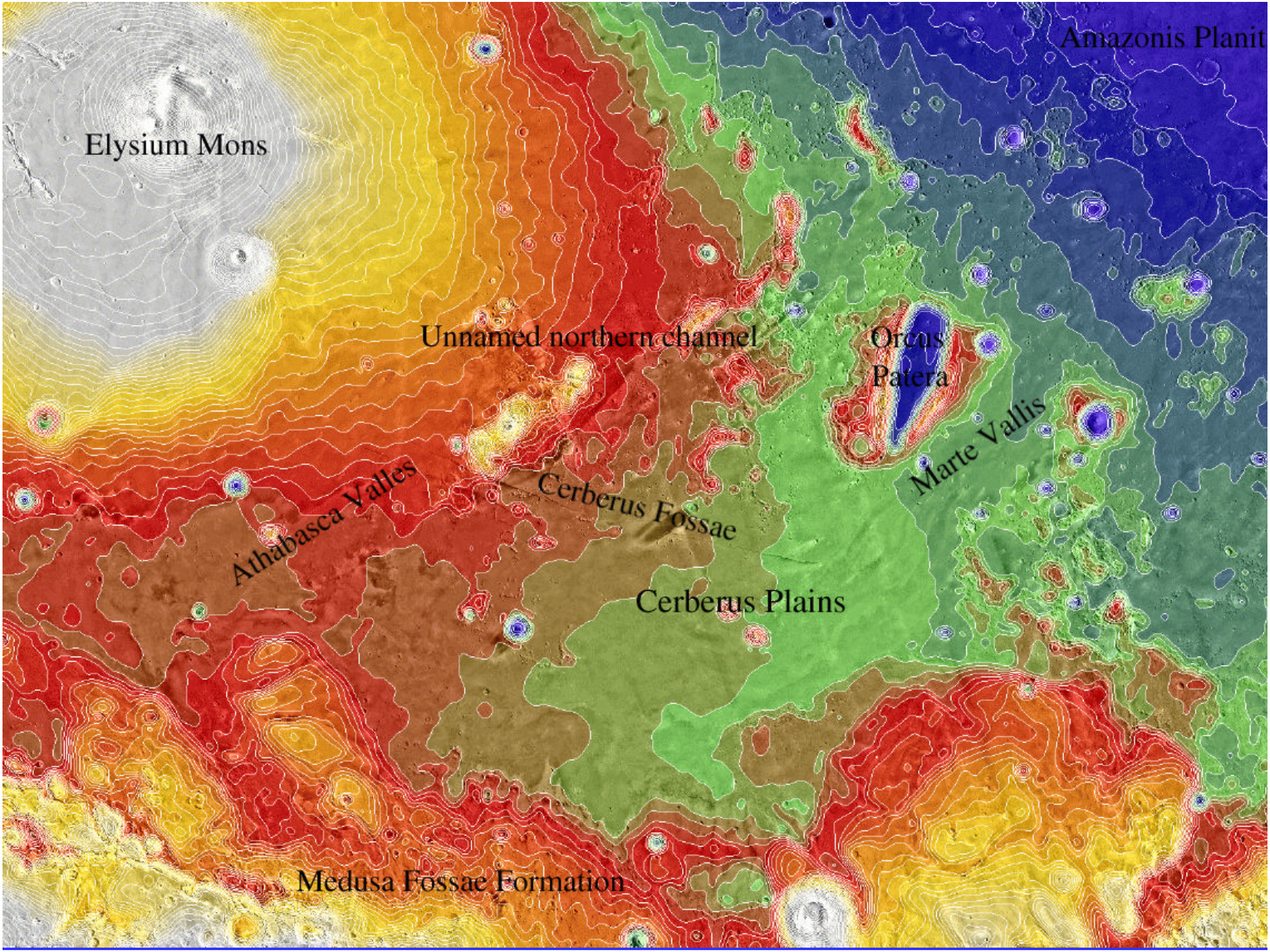
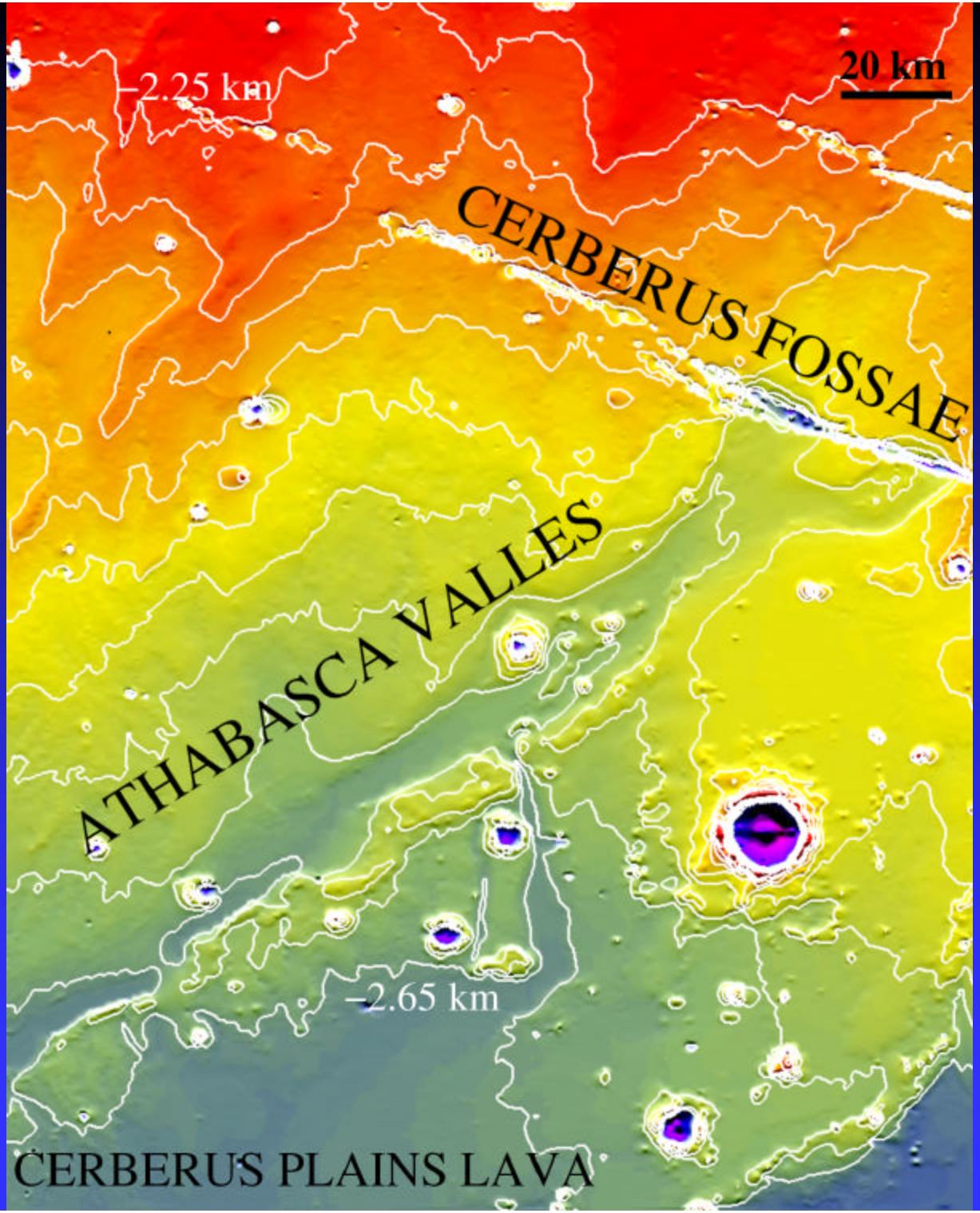
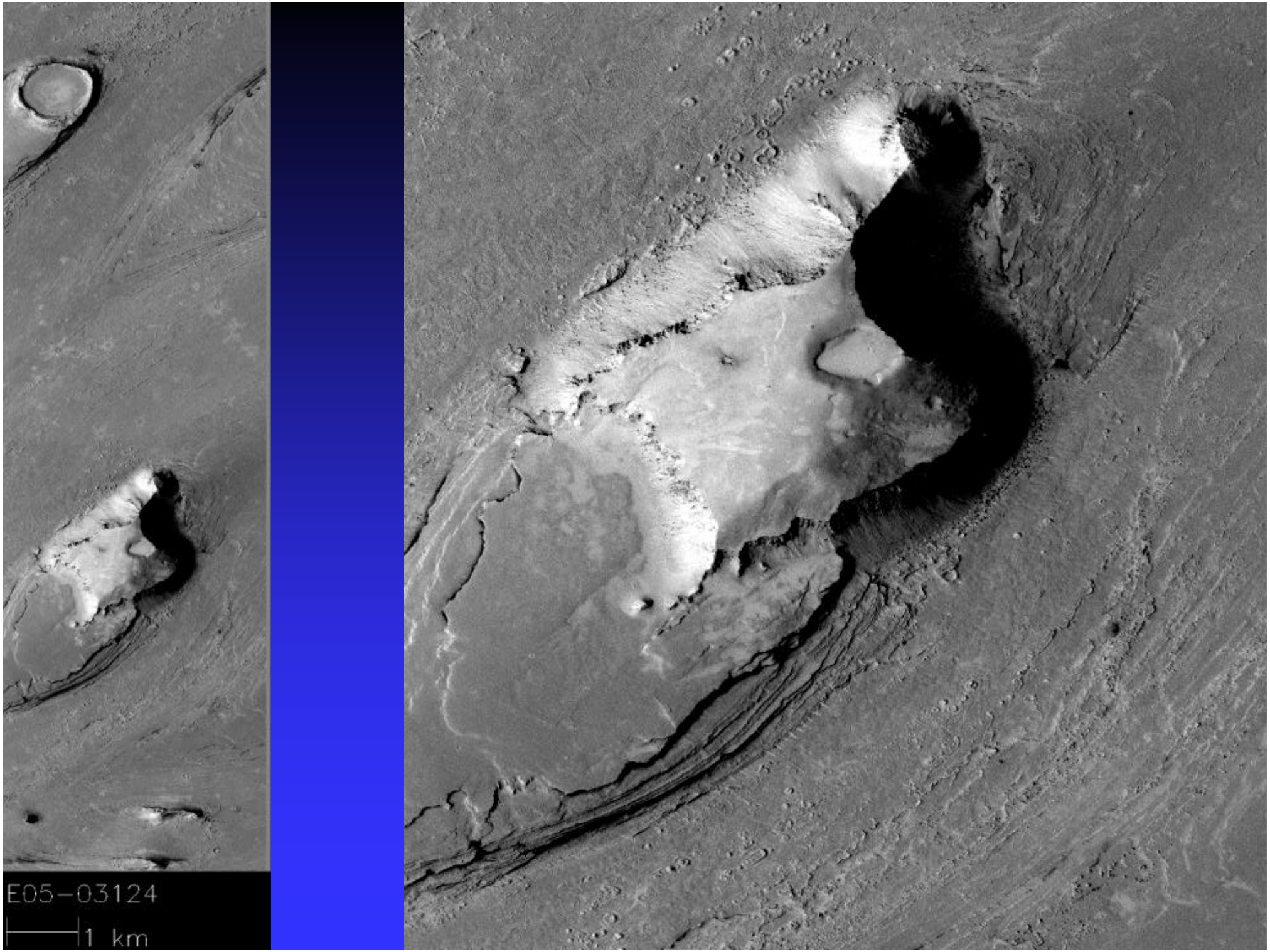
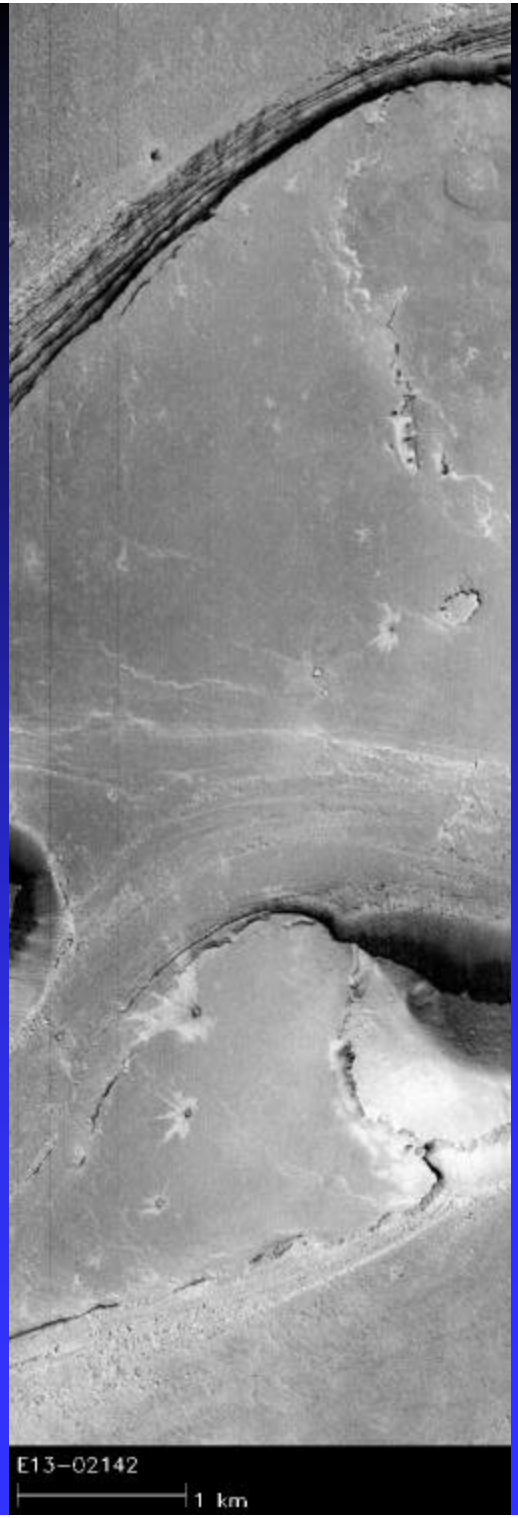
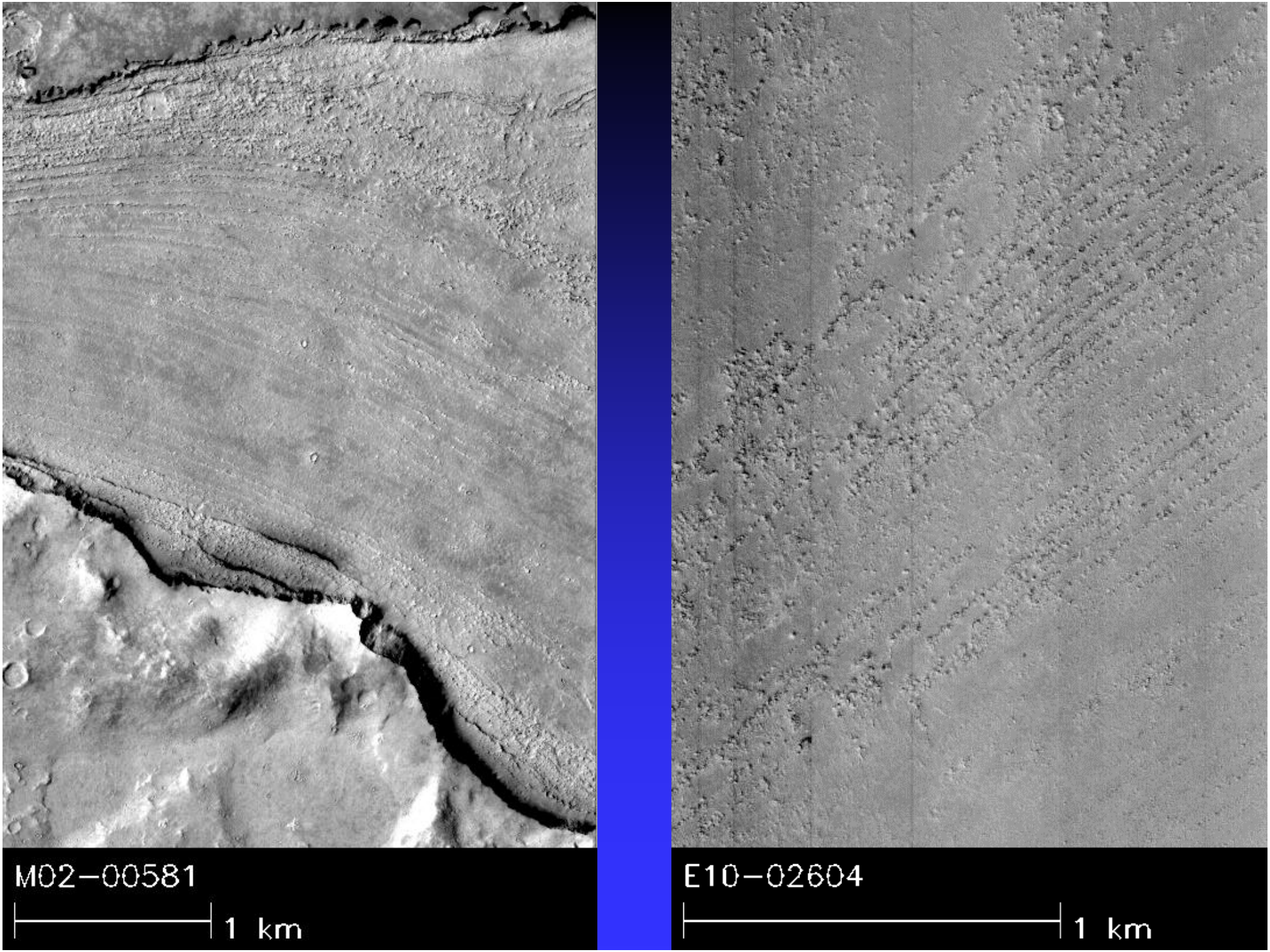

Amazonis Planit
Elysium Mons
Unnamed northern channel
Orcus Patera
Marte Vallis
Athabasca Valles
Cerberus Fossae
Cerberus Plains
Medusa Fossae Formation


−2.25 km
20 km
CERBERUS FOSSAE
ATHABASCA VALLES
−2.65 km
CERBERUS PLAINS LAVA

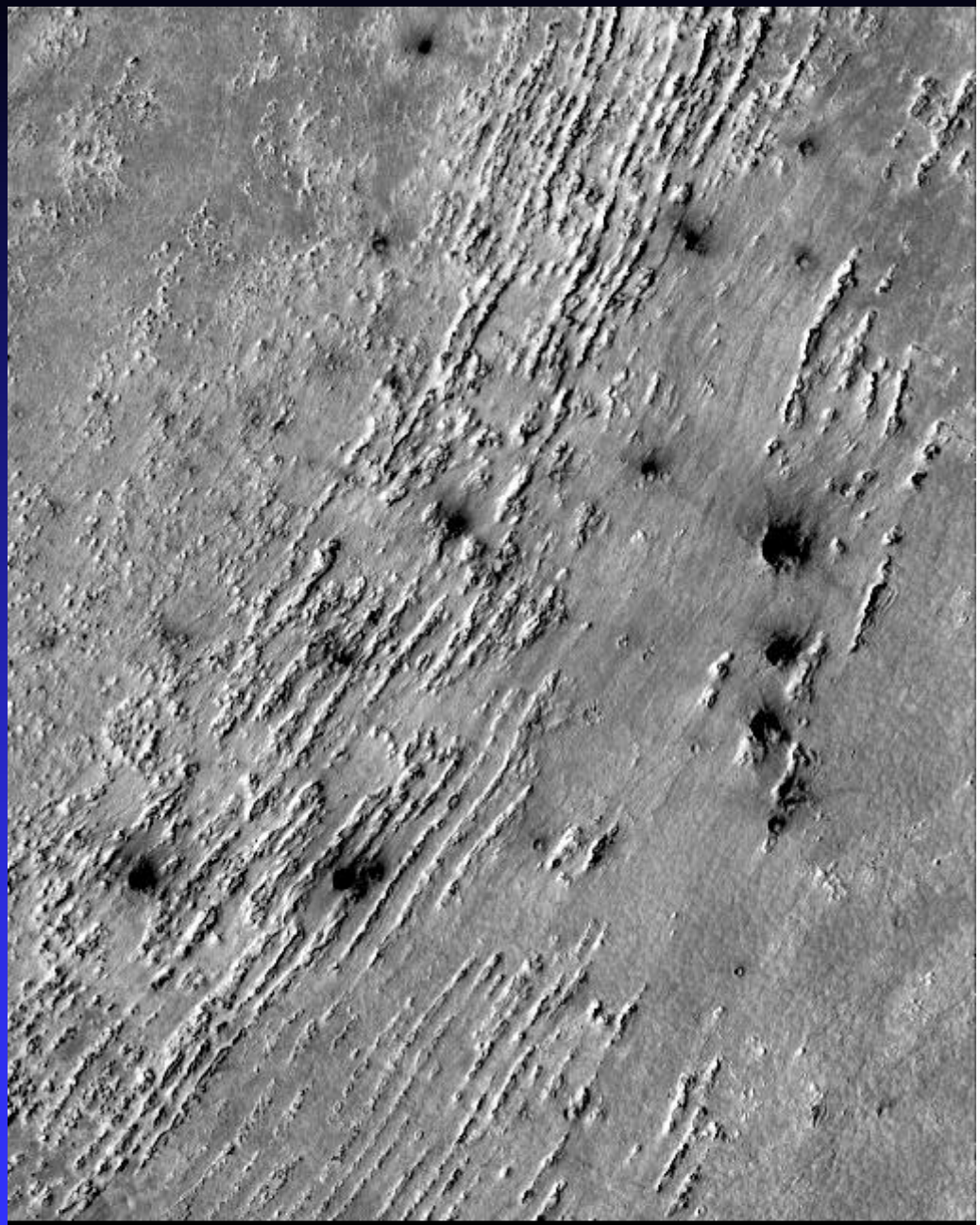

E05-03124
1 km

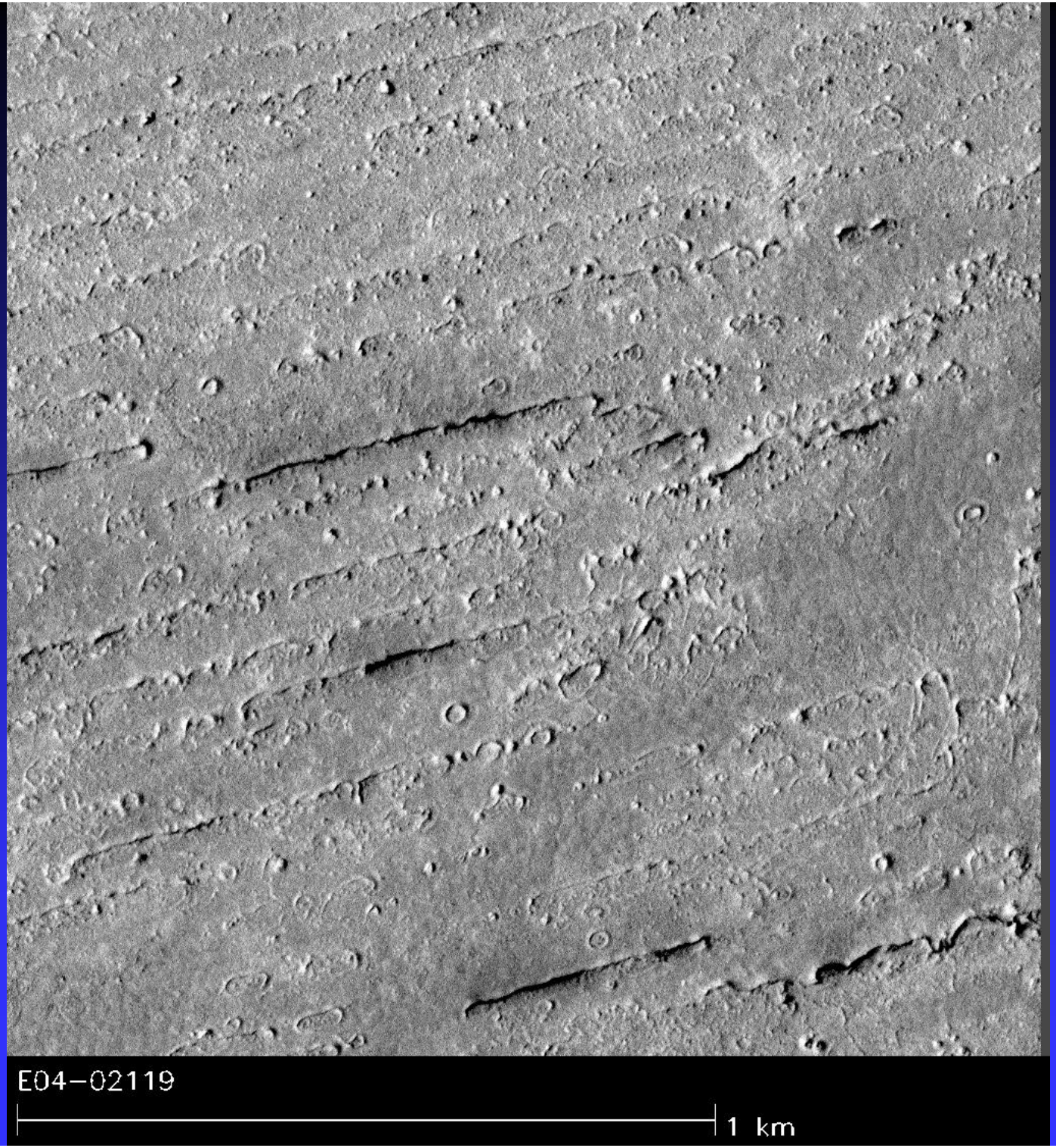

E13-02142
1 km


E12-01946
1 km

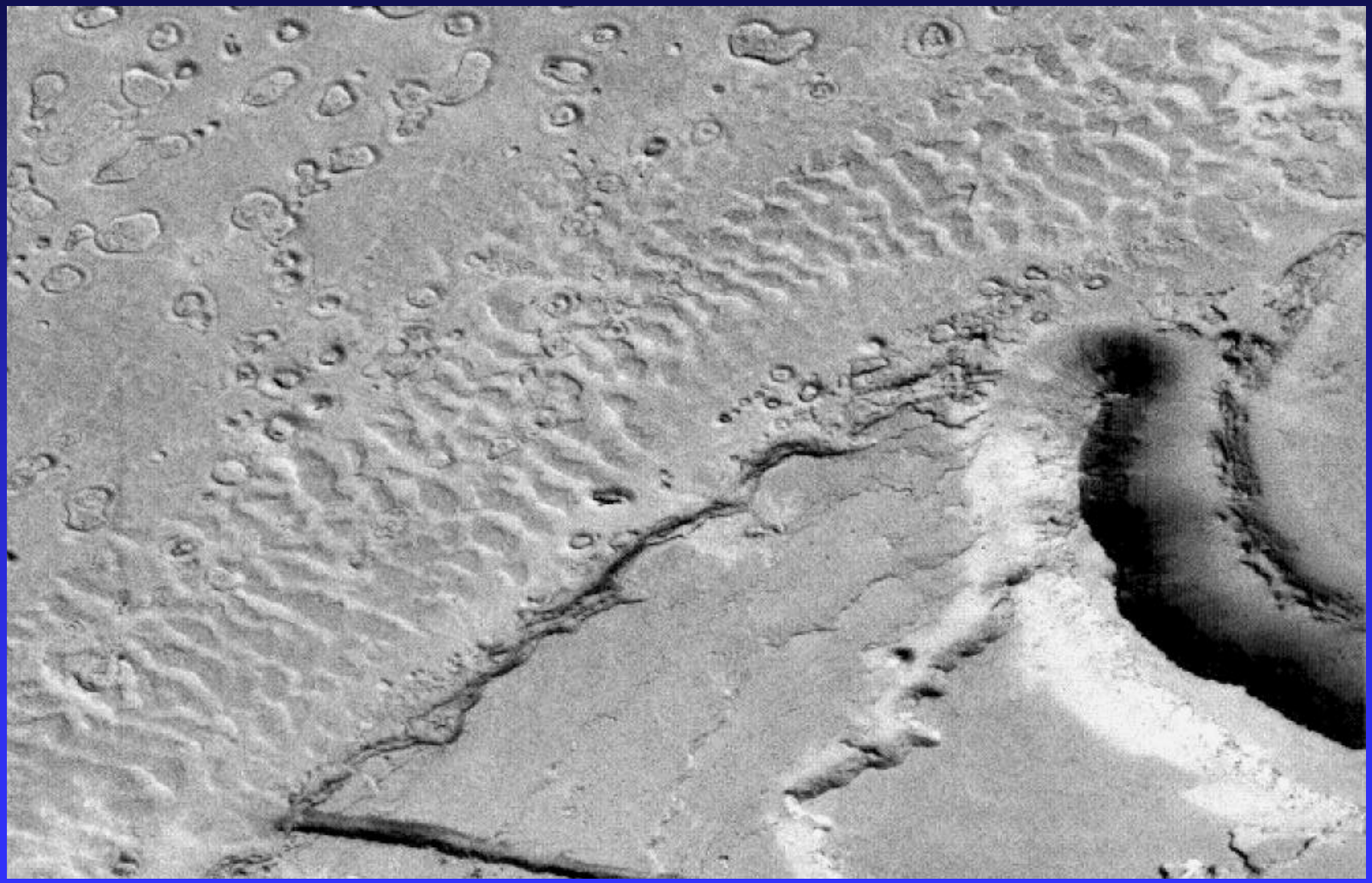

M02-00581
1 km
E10-02604
1 km


M02-00581
1 km


M02-00581
1 km


E04-02119
1 km

# Megaripples?



# Origination of floodwater

- NOT melting of ground ice in real-time
  - Too slow for the volumetric discharge rate suggested by the surface channel
  - No location of surface ponding apparent
- Therefore, must have been extant as liquid in the subsurface, i.e., either a (perched?) aquifer, or the global groundwater table

# Depth of the liquid water

- Minimal/no subsidence apparent at the surface (in contrast to the chaotic terrain)
- Therefore, must have been deep, to avoid the subsidence associated with dewatering
- Mogi model: suggests depth was (greater than) several kms

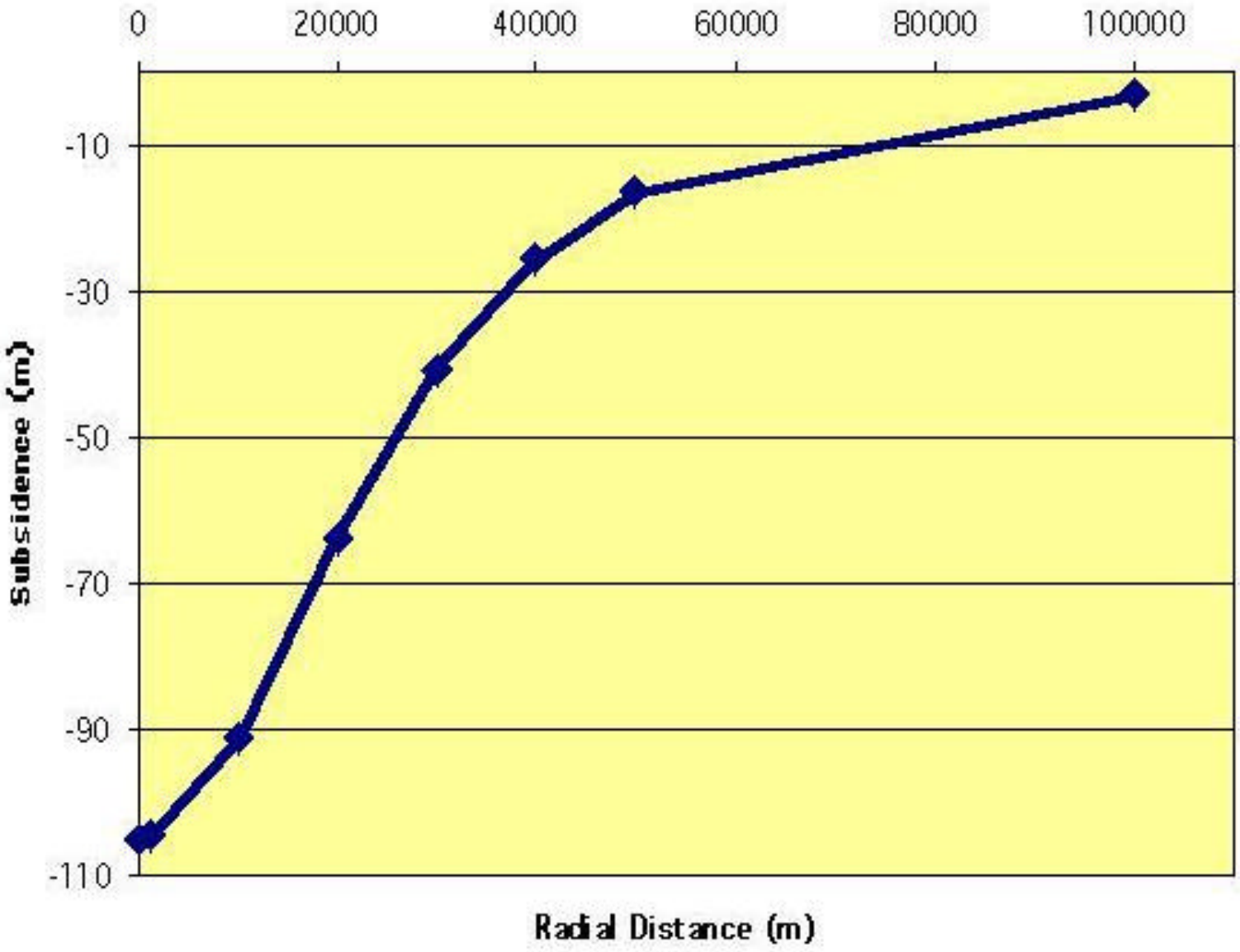
# Simple Mogi Model for Aquifer Depth

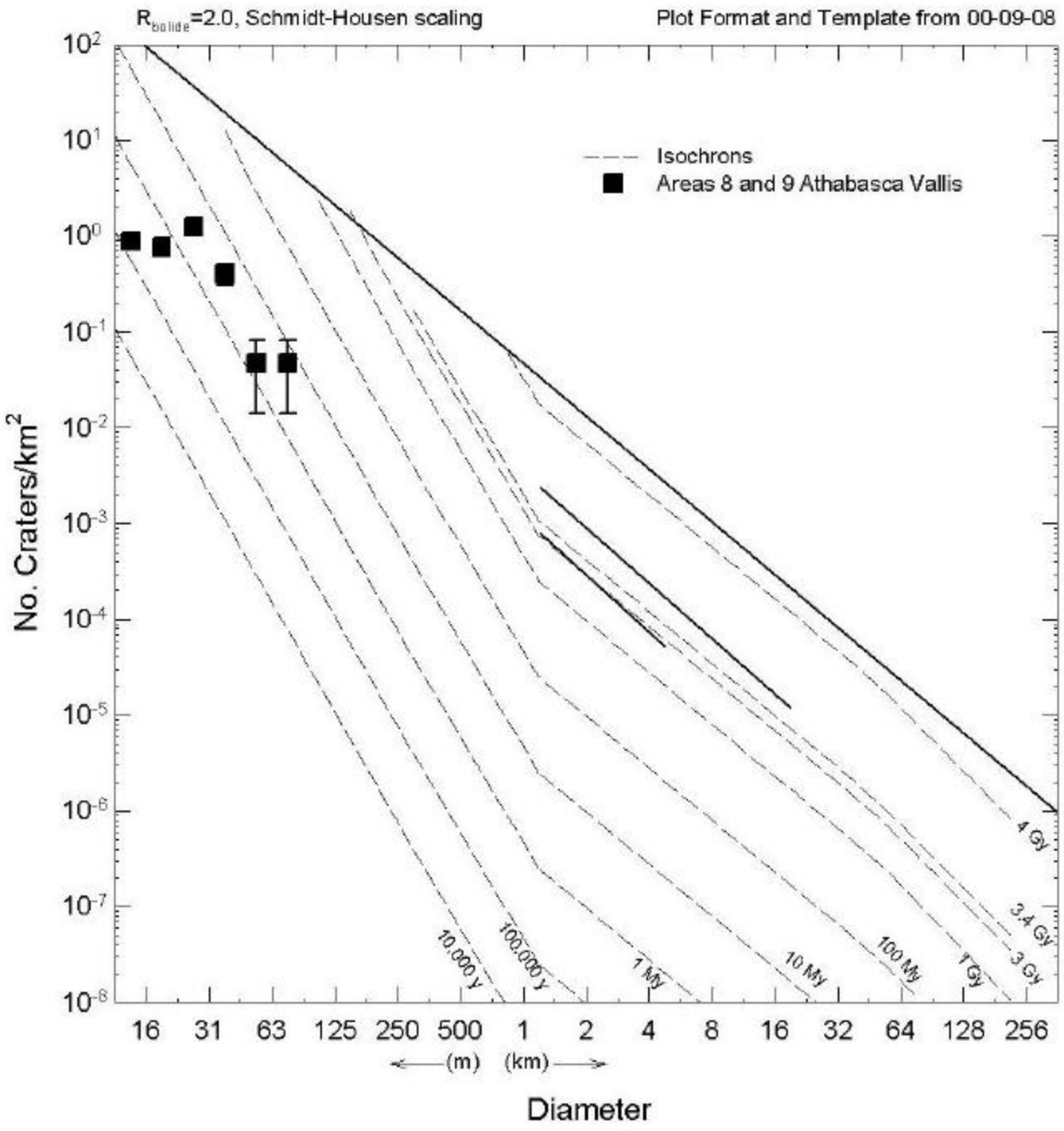
~20 km radius, ~100 m deep, depression observed at source of Athabasca Valles.

Estimated flow rates are a million $m^3/s$.

If the flood lasted a week, the aquifer must be ~30 km deep.

~1 day flood if aquifer at ~10 km.




$R_{bolide}$=2.0, Schmidt-Housen scaling
Plot Format and Template from 00-09-08
Isochrons
Areas 8 and 9 Athabasca Vallis
No. Craters/km$^2$
$10^{2}$
$10^{1}$
$10^{0}$
$10^{-1}$
$10^{-2}$
$10^{-3}$
$10^{-4}$
$10^{-5}$
$10^{-6}$
$10^{-7}$
$10^{-8}$
10,000 y
100,000 y
1 My
10 My
100 My
1 Gy
3 Gy
3.4 Gy
4 Gy
16 31 63 125 250 500 1 2 4 8 16 32 64 128 256
(m) (km)
Diameter

# Conclusions: AV was formed by

- Deep groundwater
- Recently flooded out from the Cerberus Fossae